Partial Listing

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United States Patent [19]

Wolfersberger et al.

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[54] SHOE SIZE SELECTION SYSTEM AND APPARATUS THEREFOR

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[51] Int. Cl.[5] G01B 11/24

[52] U.S. Cl. ..... 356/376; 33/3 R; 33/6; 33/515

[58] Field of Search ..... 356/376; 33/3 R, 3 A, 33/3 B, 3 C, 6, 515; 12/146 L, 142 N

[56] References Cited

U.S. PATENT DOCUMENTS

4,294,014	10/1981	Baumann et al.	33/3 C
4,538,353	9/1985	Gardner	33/3 C
4,604,807	8/1986	Bock et al.	33/3 C
4,745,290	5/1988	Frankel et al.	356/376
5,025,476	6/1991	Gould et al.	356/374

FOREIGN PATENT DOCUMENTS

14022	8/1980	European Pat. Off.	33/3 C
277918	11/1988	Japan	33/3 R
1480799	5/1989	U.S.S.R.	33/3 C
1489181	10/1977	United Kingdom	33/3 C

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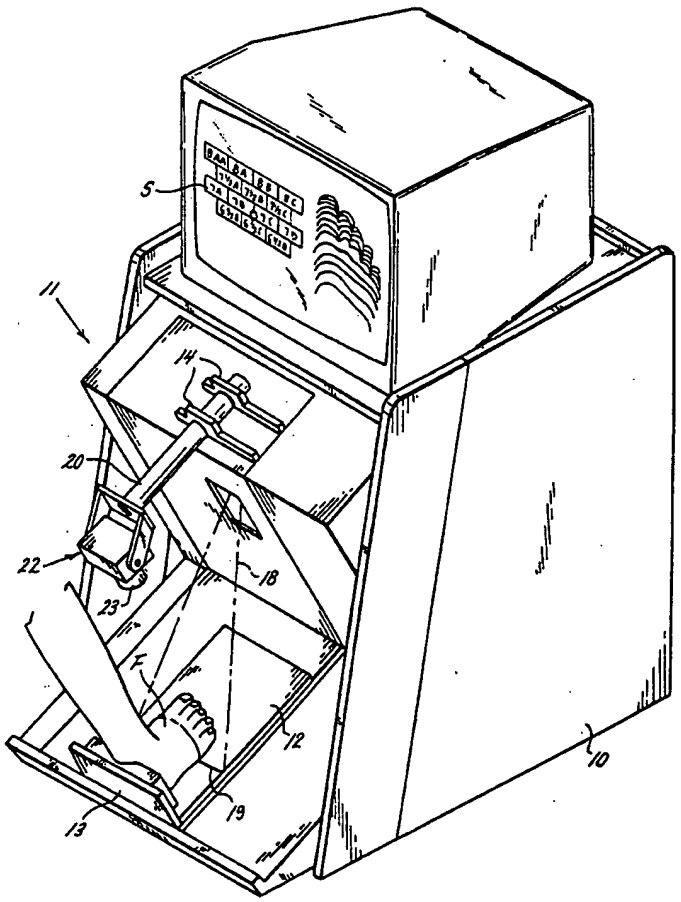
[57] ABSTRACT

A shoe size selection system using a foot image to obtain measurement information in three dimensions leading to a proper shoe size recommendation. The system provides a computer program that interprets three-dimensional information about a foot and calculates the key features that relate foot length and girth data that affect the comfort and fit of a shoe. Apparatus is used to allow the computer to reproduce on a viewing screen the results of a scan of a foot and to indicate on a chart a preferred shoe size for a foot that may be normal as to physical form or abnormal as to physical form.

10 Claims, 8 Drawing Sheets



US-PAT-NO: **5164793**

DOCUMENT-IDENTIFIER: US 5164793 A

TITLE: Shoe size selection system and apparatus therefor

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US Patent No. - PN (1):
5164793

Brief Summary Text - BSTX (11):
An important object of the invention resides in a system for measuring feet in three dimensions, rather than just two, by the use of a camera, a **laser** light source with a suitable lens, and a computer with appropriate software routines. These routines analyze the foot's toe shape and girth profile so that abnormalities can be detected, and the shoe sizing can be adjusted. The three dimensional measurement will then guarantee correspondence between foot
length, foot width, foot thickness and the most appropriate shoe size.

Drawing Description Text - DRTX (6):
FIG. 3 is a fragmentary plan view, as seen by a camera, of a foot showing the **laser** light contour across the ball of the foot;

Detailed Description Text - DETX (2):
A preferred embodiment of the apparatus of the subject invention is represented in FIGS. 1 and 2 by a foot sizing console 10 which houses a foot imager assembly 11 having a platform within the viewing area which supports a plate 12 on which a foot F is intended to be supported. The plate 12 is provided with a heel stop or heel receiving locator 13. The foot imager assembly 11 includes a **laser** light generator means 15 which upon being stimulated produces a point light source that is picked up by a cylindrical lens 15A (FIG. 2) which spreads the **laser** beam so a reflecting mirror 16 can project the beam. The mirror 16 is operatively associated with a motor means 17 which directs the **laser** beam 18 down towards plate 12. That beam when it impinges on the plate 12 (see FIG. 3) forms a straight line, which appears as a

line 19, except that when a foot F is on the plate 12, the beam will follow the contour and shape of the foot F, as is seen at dotted line 21.

Detailed Description Text - DETX (9):

The computer located in the cabinet 10 is programmed to interpret three-dimensional information about the portion of foot F that is observed by the camera 22 and scanned by the **laser** beam 18. Calculations to be performed
by the computer program are diagrammed in FIG. 5 where the angle of the **laser** beam 18 must be known, as well as the location of the focal point FC of the camera 22. The true X, Y and Z coordinates are calculated by solving for angles and sides of the triangles illustrated in FIGS. 5 and 6. Performing these calculations repetitively over visible portions of the foot results in a family of three dimensional points used to mathematically describe the forepart of the foot. This foot data is then subject to analysis to determine foot length, foot girth and finally, shoe size.

Detailed Description Text - DETX (10):

The side view of FIG. 7 is a rendering showing the portion of a foot that is visible to the camera, and is able to be digitized by the **laser**/triangulation technique described above. A top view of this portion forms the character of the image reproduced on the screens in FIG. 1.

Detailed Description Text - DETX (14):

Turning now to FIG. 12, there is shown a control system for the apparatus of FIG. 1. The computer 28 in the console 10 of FIG. 1 is provided with a motor index board 29 for stepping the **laser** beam motor 17, a video digitizer board 30 for camera 22, the touchscreen control board 31 and a graphics controller board 32 for the viewing monitor 33 having the screen S. Briefly, as the stepper motor 17 moves the mirror 16 to cause the **laser** beam to scan across a foot F, the camera records the light beam positions as seen in FIG. 7. Those beams are
digitized and become part of the graphics on the screen S.

Claims Text - CLTX (3):

(b) a **laser** light source;

Claims Text - CLTX (4):

(c) means to structure and move said **laser** light for scanning over a foot on

said support;

Claims Text - CLTX (5):
(d) camera means positioned to view a foot on said support during **laser** light scanning;

Claims Text - CLTX (6):
(e) computer means connected to said **laser** light source and said camera means to calculate three-dimensional size information about a foot on said support;

Claims Text - CLTX (32):
(b) scanning a foot with a **laser** beam from a given angular location relative to the foot;

Claims Text - CLTX (33):
(c) creating a camera visual image of the foot during the **laser** beam scanning;